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MOTIVATING STRATEGIC ALLIANCES FOR COMPOSITE INFORMATION SYSTEMS: The Case of a Major Regional Hospital

Charley Osborn
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June 1988 WP # 2031-88

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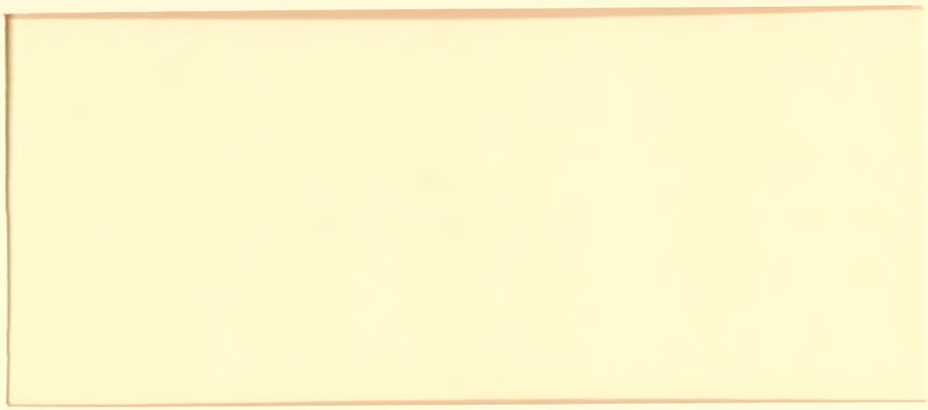

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MOTIVATING STRATEGIC ALLIANCES FOR COMPOSITE INFORMATION SYSTEMS:

The Case of A Major Regional Hospital

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ABSTRACT

This paper explores the nature of strategic goals underlying *composite information systems* (CIS) and ways to increase the likelihood of success. It studies a major regional hospital and its relationships with its physicians as part of an actual case study for providing physicians and staff convenient interface to disparate hospital departments. This situation is a particularly appropriate CIS example since the relationship is clearly loosely-coupled and inter-dependent (i.e., the physicians can affiliate with any hospital they want). Three approaches to motivate strategic alliances are identified: *bi-directional benefits, co-operative payoffs, and asymmetrical control.* Furthermore, examples are given on how these approaches were used in conjunction with the hospital's CIS.

1. INTRODUCTION

The combination of a turbulent global economy with increased competition and recent advances in computer and communications technologies have generated significant interest in, and successful examples of, using such information technology (IT) for strategic applications [Madnick, 1987] . Many of these strategic applications require inter-organizational systems (e.g., to connect with suppliers and/or buyers) or more integrated intra-organizational systems (e.g., to connect together disparate parts of the business). In either case, we refer to such systems as *Composite Information Systems* (CIS). Any effort to plan and implement a CIS must deal with the issue of motivating strategic alliances among the participants.

1.1. External versus Internal Motivation

Incentives fall into two categories: external and internal. External incentives include elements of force, coercion, and threat; they can be summarized as pressure for system use imposed from "outside" or "above". A chief executive or system sponsor may attempt to categorically order subordinates to use the system.

There are several disadvantages to such external motivation. First, if the subordinates do not see benefits to them (or even worse, perceive threats to them) they can find various surreptitious ways to sabotage a system. As one top executive commented about such approaches, "you have no idea how little power a president really has." Second, in a CIS environment we are attempting to form alliances between loosely-coupled participants, whether inter-organizational or intra-organizational. Thus, there usually does not exist a strict power hierarchy through which such external incentive may be accomplished. This can be particularly important since a system "champion" who has been successful with implementing systems within his own organization through external incentives or a shared organizational goal may be ill-prepared to operate in a CIS type of environment.

Internal incentives, on the other hand, are those which encourage participation on the basis of "what's in it for me" for each party. It is important to note, and it is often the case, that the benefits may not be the same for all participants. For example, direct entry of a newspaper reporter's story into a computer system through terminals results in a cost savings to the publisher (by decreasing typesetting costs) and a time compression to the reporter (by decreasing the time between story writing and printing, the deadline is extended and the likelihood of immediate publication is increased).

Internal incentives tend to be supportive rewards that lead to self-perpetuating system use. Persons using the CIS under conditions of internal incentives clearly perceive circumstances in which the system helps them fulfill their responsibilities more efficiently or effectively.

1.2. Strategic Design for Internal Motivation

Because a CIS by definition tends to work across traditional organizational boundaries, CIS design must deal directly with difficult organizational problems involving conflicting interests and perspectives.

This paper uses the experience of one organization, a major regional hospital, to illustrate a strategy for CIS development that uses disparate organizational interests to advantage in high-level systems design. It builds tactics for design success from three aspects of internal incentives: 1) bidirectional benefits, 2) cooperative payoffs, and 3) asymmetrical controls. These three elements are examined in some depth, as part of a design effort which uses a market structure model to locate and encourage usage based on internal incentives. The cooperative and incentive-based aspects of boundary-crossing CIS receive particular attention.

2. HOSPITAL CASE

The hospital example was chosen specifically because it illustrates the complexities faced by system designers in dealing with competing organizational interests and because it demonstrates that effective design solutions to such problems need be neither technically complicated nor extremely expensive.

The hospital in question is a large and successful organization. It has over 40% (774 beds) of the licensed beds in its region; its bed utilization rate of 71% compares favorably with the 68% of its closest competitor; it represents the tertiary care facility of choice for over 1,000 physicians. The institution itself is the flagship facility for one of four dominant multi-hospital systems in a large Midwestern city.

2.1. Hospital Goals

The hospital's CIS is known as the Professional Information Network (PIN). The PIN system represents the hospital management's latest strategy for building inter-organizational bridges between the hospital and its attending physicians' practices. The hospital's managers believe that strengthening loyalties between physicians and the hospital is an issue of strategic importance.

Their perspective is based on changes in the structure of the health care market in the institution's local area. Competition for patients is increasing, intensifying the importance of patient volume and market share. Negotiated pricing is being encouraged by Health-Maintenance Organizations (HMOs). In the region HMOs represent 50% of the patient population compared with 10% nation-wide. These factors have combined with rising operating costs to put hospital revenues and profits under serious pressure. Other hospital chains located nearer to affluent portions of the city have an advantage when targeting low-risk HMO patients. New competitors are appearing. Free-standing clinics siphon off high-revenue low-risk procedures (such as radiology). Primary-care hospitals are attempting to develop their own specialties. Smaller hospitals are consolidating with large multi-hospital organizations as their financial conditions worsen. These competitive threats can be summarized using the market framework introduced by Porter [1985], in terms of a combination of five forces: 1) rivalry among existing competitors, 2) threats from new entrants, 3) increased bargaining power from buyers, 4) increasing pressures facing suppliers, and 5) a proliferation of substitute services. The specific situation for this hospital is depicted in Figure 1

The hospital's managers have isolated the critical aspects related to each of these competitive threats and have developed strategies for countering them. The institution intends to bolster market share and patient volume by building its reputation among physicians and its image as a specialty health-care institution among the public.

Patient referrals are a key method for building volume. Because physicians are responsible for more than half of referrals, the physician relationship becomes a key strategic factor in maintaining the hospital's financial health. It is in the organization's strategic interest to bind its physicians as tightly to the hospital as possible. Services provided by the hospital which save the physician time or which reduce the overhead associated with the physician's practice thus assume strategic importance.

Regulatory developments suggest, moreover, that as time passes the hospital will have to ask physicians for increasing amount of proprietary data in assembling cost estimates for pricing

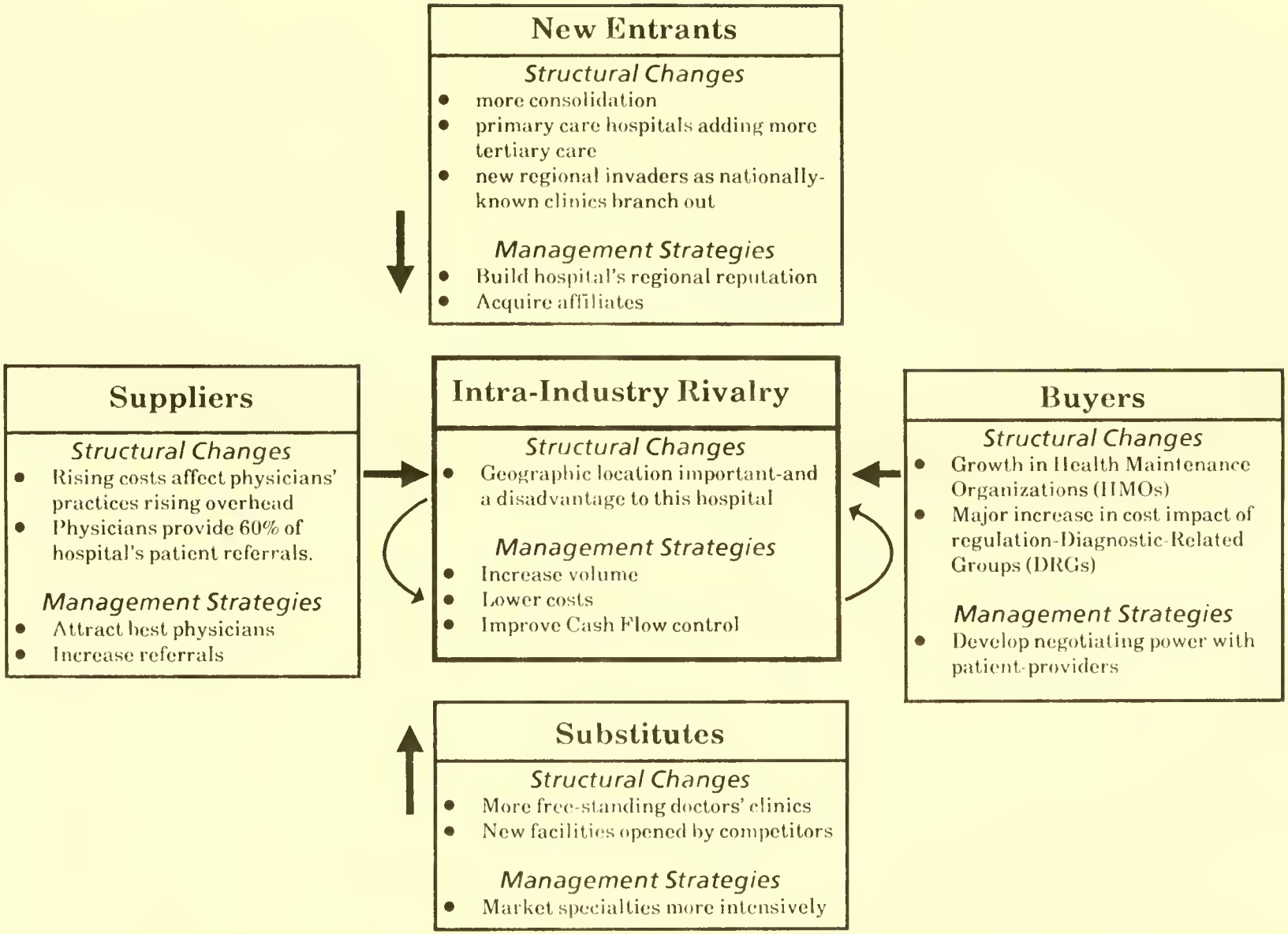

Figure 1 Market Forces Diagram

negotiations. If the hospital can provide important services to its physicians over an electronic network while simultaneously acclimating its physicians to the convenience of electronic data transmittal, the institution can initiate a linkage which will grow in competitive importance over the next decade. PIN represents an attempt to accomplish these goals.

2.2. Physician Goals

At the same time that the hospital was facing these threats, the physicians were very concerned about rising overheads in their practices. With increasing paperwork requirements forced by the pressure of malpractice, higher insurance premiums, increasing clerical salaries, and higher office expenses of all types, overhead is often exceeding 60% of a physician's revenues. These factors led to a new focus on the part of many physicians--a focus on cutting the costs of their own businesses. This meant looking more closely at the costs of running their own offices and opportunities to improve efficiency and effectiveness.

3. THE PROFESSIONAL INFORMATION NETWORK

The Professional Information Network (PIN) system is primarily inter-organizational in scope and provides seven core services:

1) The electronic mail service links physicians offices with the hospital and with each other;

2) The referrals service routes patient referral information between physicians and the hospital;

3) The lab status service allows physicians to request lab tests and to obtain results;

4) The pharmacy service takes orders for medications and advises on new dosages and drugs;

5) The Pre-admission and operating room scheduling services allow physicians' offices to contact hospital staff electronically with information important to hospital work flow and cost control;

6) The Consultation requests service allows physicians to contact each other, via the network, to schedule inter-physician consultations;

7) The library application service allows physicians to send notes to the hospital's librarians asking for database searches on chosen medical topics. The results of the searches--article abstracts and studies -- are sent back to the physicians through the electronic mail.

As a Composite Information System, PIN crosses both interorganizational boundaries (from hospital to physician's offices) and intraorganizational divisions (between hospital departments). PIN is attempting to initiate access to distributed sources of data and to provide a standardized "data highway" for all of the hospital's constituencies.

PIN exists to establish connectivity between independent systems. It spans "product areas" within the hospital by providing the physician a common interface to many hospital services. As such, PIN exhibits important CIS characteristics:

1. It derives its value from specific cross-boundary linkages (hospital to physician, hospital to hospital, physician to physician).

2. It allows asynchronous coordination of potentially conflicting interests and procedures.

3. Its operating details are largely transparent to its target audience (the physicians).

4. It is used by its developer (the hospital) as a partial solution to specific strategic problems (physician satisfaction, referrals and patient volume, operating cost control).

4. MOTIVATING STRATEGIC ALLIANCES

In studying PIN, we can relate it to aspects of the CIS process model depicted in Figure 2. One perspective to the model is a four-stage approach to CIS development:

1. Specify strategic goals;

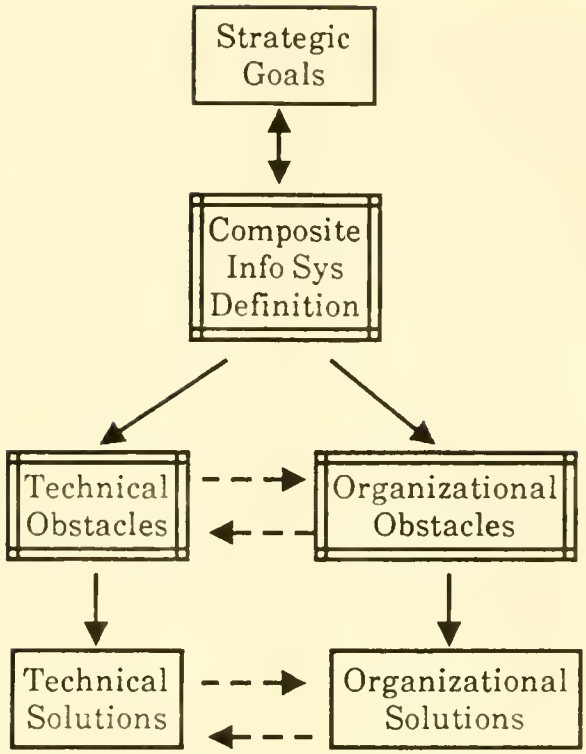

Figure 2 A Composite Information Systems Model
(Source: Madnick and Wang, 1988)

2. Identify an appropriate CIS;

3. Identify technical and organizational problems associated with that CIS;

4. Apply organization theories and information technology to solve the problems.

At the highest level are strategic considerations. Industry conditions and operating limitations constrain the hospital's strategic choices, and its managers must select from among those choices. The market analysis framework depicted earlier in Figure 1 gives us a method for categorizing strategic choices and selecting among them .

As strategic goals become better defined, the characteristics of the CIS environment increasingly depend on the organizational problems which impede the execution of these strategic choices. Particularly important at this level are the local interests prevailing within particular organizational boundaries. Solutions to organizational problems of conflicting local interest depend largely on the success with which a CIS can cross such organizational boundaries. This paper suggests three

elements important to building cross-boundary incentives labelled: *Bidirectional Benefits, Cooperative Payoffs, and Asymmetrical Control.* They are depicted in Figure 3 and explained below with the hospital's experience used to provide illustrations.

4.1. Bidirectional benefits

CIS appear to be more successful when both parties - on either side of the organizational boundary which the system crosses - clearly see "what's in it for me". The advantages accrue to the parties involved individually; they are tagged "bidirectional" because we can identify a related benefit to each participant (i.e., each can see that there is "something in it for me", even though the "something" may be different).

For example, PIN's referrals system gives both hospital and physicians individual benefits. If a physician refers a patient to the hospital, the hospital benefits (but what's in it for the physician?). If the hospital refers a patient to a physician, the physician benefits (but what's in it for the hospital?). An analogy can be made to Robert Axelrod's conception of business situations as iterated prisoner-dilemma games. Axelrod describes a "prisoner's dilemma" as follows:

> "In a Prisoner's Dilemma game, there are two players. Each has two choices, namely cooperate or defect. Each must make a choice without knowing what the other will do. No matter what the other does, defection yields a higher payoff than cooperation. The dilemma is that if both defect, both do worse than if both had cooperated" [Axelrod, 1984]

By recognizing this relationship, and realizing that there are reciprocal benefits to be gained by each party, a basis for sustained internal motivation can be established. In the particular example described above, the nature of the benefits for each participant (i.e., referrals) is similar. This is not necessarily the case as seen in other PIN applications to be presented later.

4.2. Cooperative payoffs

In a sense the idea of cooperative payoffs is based on the notion that the system provides benefits to participants in an aggregate. The terms emphasize that successful CIS can offer collective (as opposed to individual) advantages that encourage parties associated with the network to use it. In

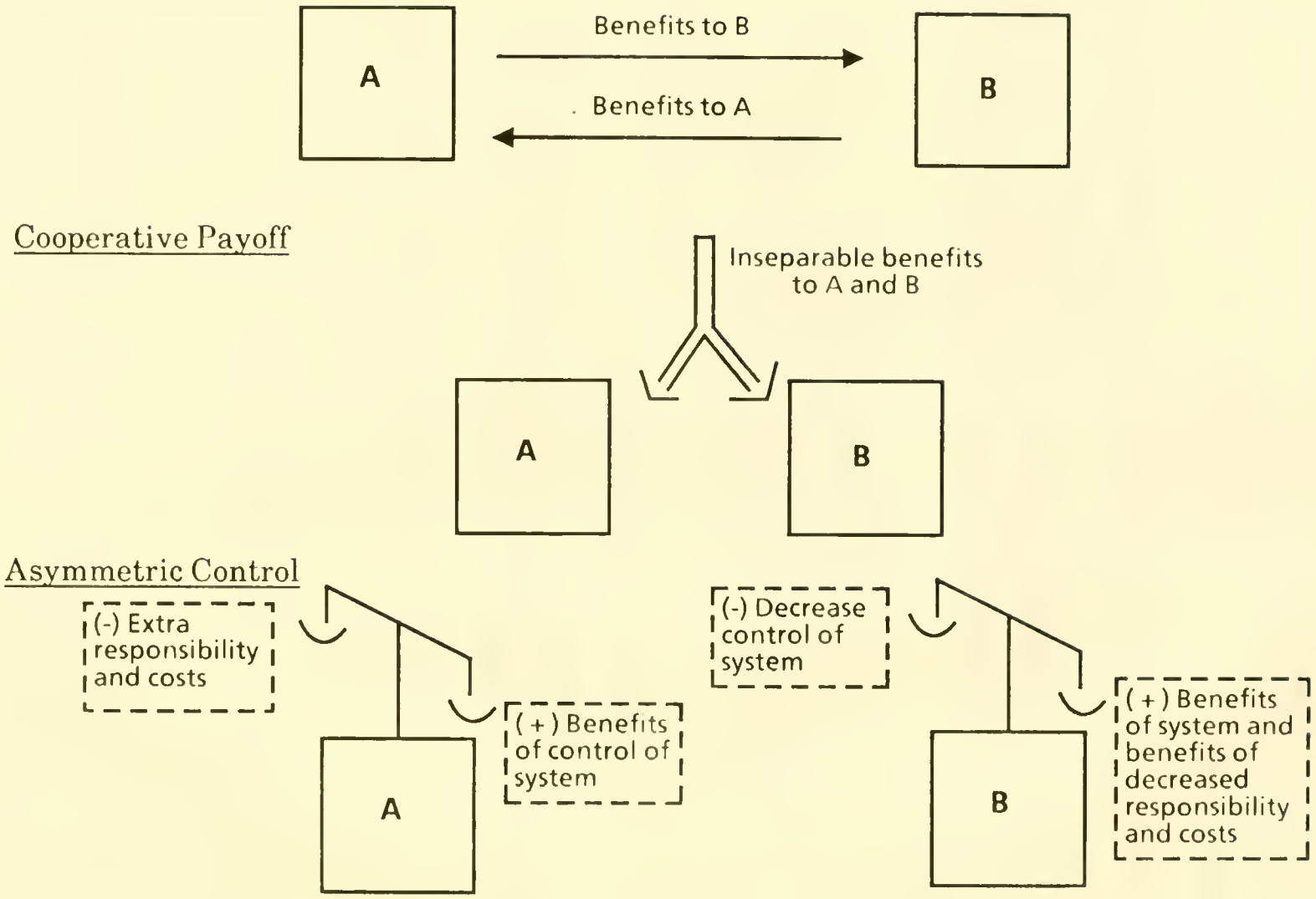

Figure 3. Approaches to Internal Incentives

other words, the network provides something to its participants in aggregate (a "payoff") that comes from using it and in this sense "cooperating" with other players.

For example, physicians want to use the hospital's pre-admission and operating room scheduling system because it saves them time and frustration on the phone. The physicians' offices run more smoothly, scheduling is more efficient, and busy physicans and their staff can spend more time seeing patients and less time dealing with office problems. The hospital gains directly as well because it has a better idea of the scheduling load on its facilities, and it has more flexibility in rescheduling admissions and procedures than was available when requests had to be processed in a single telephone conversation. Note that the specifics of the benefits to be gained by each party may be, as in this case, different. But, neither party benefits unless both participate. If the physicians did not provide the pre-admission information, there is no way the hospital could gain its improved operational efficiency. If the hospital did not use the pre-admission information, the physicians would have to use the traditional, and inefficient, telephone scheduling procedure. By cooperating and coordinating through PIN, both parties achieve a cooperative payoff.

4.3. Asymmetrical Control

In any CIS setting the issue of who controls the system is important. Standards can be difficult to implement when many disparate groups are involved [Sirbu and Stewart, 1986]. By keeping control of the system it is possible to build dependencies that are of strategic importance.

For example, the hospital's plans to provide services to its physicians hinge at least in part on a desire to develop in physicians the habit of sending information across the network. Hospital managers expect the market to change over the next five years in ways that will force the hospital to ask physicians for increasing amounts of potentially proprietary data. They anticipate that this task will be easier if this information could be automatically captured by the PIN system and if physicians are already familiar with the process. But why should the physicians give control of the system to the hospital? This is addressed below.

Physicians vary greatly in their systems knowledge and technical interest. Busy with their practices, they probably could not find the time to think about system specifications, much less agree on a single design. Thus, the physicians are willing to give up some "control" in return for the functional and efficiency benefits provided by PIN and the convenience of having the hospital operate it. By presenting them with a service and essentially controlling the mechanics of the network completely, the hospital can (1) make PIN easy enough to use so that it will be used and (2) encourage physicans to build habits supportive of electronic data transfer. Both aspects of the system are of strategic interest to the hospital, and both arise from the hospital's asymmetric control over PIN's specifications.

5. DESCRIPTION OF PIN APPLICATIONS

Now that we have described the various ways to motivate strategic alliances, we will describe each PIN application in more detail so that we will be able to see how these ideas can be applied.

1) Electronic Mail

PIN provides a UNIX-based electronic mail system connecting all system participants. The mail network links physicians' offices with the hospital, with each other, and even with some HMOs. The result has been much better communication of routine news between all parties. This link has been particularly important because many of the hospital's non-surgical physicians have been forced by industry changes to spend less time in the hospital and more in their clinics. The mail network can reach them and is often more effective than pagers, since they do not always answer their pagers.

2) Referrals

The hospital provides a number of community services, such as the Medformation Hot-Line. PIN provides the Medformation staff with the ability to enter the information from a caller and refer the caller to an appropriate physician. This is a natural extension of the hospital's efforts to place patients which physicians who practice near them.

The PIN referrals service also routes patient referral information to physicians through the hospital's information network. This routing also allows the hospital to capture more marketing information (such as geographic patient concentrations from patient zip codes) and tracking data (such as which physicians are getting what referrals and whether they ultimately make use of hospital facilities) than previous telephone referrals permitted. The growing pool of data is becoming a useful marketing tool for the hospital. It has generated a mailing list of all patients who may potentially pass through hospital facilities. Hospital management knows, by zip code, which areas are short of physicians and may be fertile territory for opening a new practice. The database's listings of physician consultations allows the hospital to pinpoint the best of its physicians. Compilations also show which physicians bring the most patients through the hospital.

Cross-tabulation of all these factors provides a picture of potential high-quality, "loyal" physicians. The hospital has made a conscious decision to identify such physicians especially among its younger physicians and to "invest" in such individuals by suggesting locations to open a practice. The hospital has even helped finance the practice until the physician's own patient volume becomes high enough.

3) Lab Status

Lab test were typically ordered by surface mail or by pneumatic tube system. Results were returned by mail or by courier. When labs became backed up, delays could stretch for several days on some tests - during which time the physician would have no idea of the test's progress.

Physicians now use PIN's lab status system to request test and receive results directly from the hospital's labs, saving time and keeping patients better informed PIN allows for immediate checks on the status of lab results, removing the delay of physical mail-handling once tests are completed. The system reduces the number of times the physician is embarrassed in front of a patient because lab results are inexplicably delayed, lost or incomplete.

4) Pharmacy

The PIN pharmacy system takes orders for medications; advise on new dosages and drugs is also available. Choosing the correct drug and dosage from among the increasing numbers of alternatives

available is a steadily more complicated task. The hospital has found that many physicians, pressed for time, develop over the course of several years "favorite" drugs and dosages. Some of these are less effective than other alternatives, and some are more expensive for the hospital pharmacy to provide than others. The pharmacy system provides a way for the hospital to suggest alternative dosages or drugs in a non-threatening manner. The system also remembers personalized directions for each patient, allowing physicians to provide small but helpful touches to dosages and prescriptions. Lastly, the system provides a record of the latest formulations available so that a physician can refresh his or her memory on particular details.

5) Preadmission and Operating room scheduling

The PIN pre-admission and operating room scheduling systems allow physicians' offices to contact hospital staff electronically with information important to hospital work flow and cost control. When this job used to be done over the phone, physicians' staff consistently complained of being left on hold and of making multiple calls for one simple task. Scheduling the hospital's 26 operating rooms used to be a serious bottleneck. For the hospital, it is critically important to run the operating suites at full capacity - they are among the most expensive parts of the facility. For the physician's office, it is critically important to schedule an operation at a time convenient for both patient and physician, and to do so in a manner that allows for flexible schedule changes if needed.

PIN changes the scheduling work flow. Physicians' staff members fill out an on-screen form which is then immediately available to the hospital's operating room scheduling office. There hospital staffers build the schedule as usual. Assigned times are communicated through the e-mail network. The new system has several advantages: (a) physicians' staffers no longer waste time on the telephone; (b) hospital schedulers have a better idea of operating room load at critical times, and can shift room assignments or make other changes to increase scheduling flexibility (not all operating rooms, for example, are the same size); (c) as a result, operating room schedules appear more flexible; and (d) physicians get scheduling results back faster--leading to significantly improve relations between the hospital and its physicians.

6) Consultation requests

The PIN consultation requests system allows physicians to contact each other, using the hospital's network, to schedule inter-physician consultations. These arrangements increase physicians' revenues and give hospital managers better data on the flow of consultation work. PIN provides an electronic form for requesting consultations. Delays are less frequent than when arrangements were made through phone calls by physicians' office staffs, and the hospital gains a record of every consultation requested and billed. It can assemble information on which physicians request the most consultations and which physicians are asked most often for a second opinion. It can tell which types of cases are most likely to generate consultations, and so flag serious cases which might generate above-average expense levels. In their highly competitive market, such information takes on high importance.

7) Library

Lastly, the PIN library application system allows physicians to send requests to hospital librarians asking for database searches on chosen medical topics. The results of the searches--article abstracts and studies -- are sent back to the physicians through PIN's electronic mail. This service has proven especially popular with young physicians who are considering the hospital as a place to base a practice. These young MDs usually come from a medical school which had a search service (although usually not providing PIN's ease of electronic requests and responses); for them this aspect of PIN is a strong selling point.

6. CIS DESIGN BASED ON BENEFITS, PAYOFFS, AND CONTROL

If bidirectional benefits, cooperative payoffs, and asymmetrical control all play a part in the acceptance and usefulness of a CIS, how can system sponsors and designers identify elements which a system should emphasize? This paper suggests an approach to identify key benefits, important cooperative payoffs, and potential points of control.

The proposed approach uses Porter's market structure model [Porter, 1985] as a basis for examining individual and organizational positions which the CIS is intended to connect. Rockart's Critical Success Factors approach [Rockart, 1979] is used to describe the key interests and needs associated with each positions . These two analytical steps help clarify the constituent interests which the CIS must treat. Porter's Value Chain analysis then provides a means for identifying areas where the CIS might link complementary needs. Lastly, we introduce a "value chain payoff matrix" as an aid in prioritizing potential CIS applications.

6.1 Identifying Strategic Goals

The hospital is under pressure in each area identified in Porter's model (see Figure 1):

- it has a poor location relative to competitors for attracting low-risk patients;
- it faces threats from large out-of-state specialty clinics, which are absorbing high-end business by means of their nationally-known expertise;
- the regional concentration of HMOs and of large corporate health care plan sponsors is increasing;
- rising costs and higher overhead affect the health of physicians' practices which supply the hospital with patients, forcing them to seek higher prices, and
- walk-in clinics siphon off low-end business, offering substitute medical care without the burden of full hospital overhead.

The hospital's managers have developed strategies for dealing with these competitive factors as depicted earlier in Figure 1. Their decisions reflect (a) the industry's structure and how it is changing; (b) the options available to the hospital; (c) the choices which they prefer among those options; and (d) the consequences implied by those choices. In the hospital's case, for example,

referrals represent a key link through physicians to the potential patient base - and so to increased patient volume. The referrals, consultations, and library research services provided by PIN attempt to strengthen this hospital-physician connection.

A key factor in the success of CIS development lies in the organizational boundaries which system sponsors first choose to cross. PIN demonstrates that hospital management recognizes the need to build bridges in key areas between the hospital and its patient-providers. Management has closely examined the business needs of its physicians and is attempting to construct electronic services that emphasize areas where physician and hospital needs can be made to match.

6.2 Interlinked Value Chains

One way of expressing this process is to use Porter's "value chain" concept to represent the interests of each organizations involved [Porter and Millar, 1985]. Both the hospital's operations and the physician's practice can be described as moving through similar stages of providing service and earning surplus or profit. Using an industrial production operation as a metaphor, both hospital and physician engage in:

- Inbound logistics: For the hospital and its physicians, these activities center on gaining patients through referrals and other sources.

- Operations: The hospital provides the physicians with services and access to hospital equipment. The physicans provide patients and hospital with diagnosis, prescriptions, and operations.

- Outbound logistics: Discharges, billing, and cash flow considerations are important aspects of this value chain segment for both parties.

- Marketing and Infrastructure: Value Chain categories also cover non-direct expenses such as marketing or overhead. Examining these aspects of hospital operations and the physicans'

practices highlights the importance of referrals to each party, as well as emphasizing the importance of rapid collections to the hospital and of overhead expenses to the physicans.

An examination of inter- and intra-organizational value chain linkages is useful for uncovering "target" cross-boundary connections. Figure 4 suggests how value chain analysis can be a useful tool in revealing organizational problems - particularly the characteristics of localized constituencies, their particular interests, and the threats they perceive from other organizational units.

The usefulness of this representation arises from mapping PIN applications across the hospital and physician value chains. Figure 4 shows how the PIN Referrals application, for example, provides inbound logistics and marketing benefits to both hospital and physician. On the one hand it makes the process of collecting patients faster and easier (inbound logistics). On the other hand PIN improves response time to referrals (making both hospital and physician look better in the patient's eyes) while providing important marketing information about the regional patient base. Each PIN application is carefully constructed by bridging common interests in these value chains. The linkages supported by several PIN services are shown in Figure 4. This analysis helps identify what is important to each player in an inter-organizational situation.

6.3 Value Chain Payoff Matrix

Figure 5 categorizes bi-directional benefits, cooperative payoffs, and asymmetrical controls for four selected PIN applications in a value chain payoff matrix. The table suggests how each party gains from using the system; it can be used to analyze specific inter-organizational value chain linkages for their potential as target CIS boundary-crossings. Earlier we described how the referrals application takes advantage of bidirectional incentives, how scheduling can result in cooperative payoffs, and how the separation of the design and the use of the system allows the hospital to gain from asymmetrical controls. Similar results can be observed for the Pharmacy application and for other PIN applications not included in this matrix.

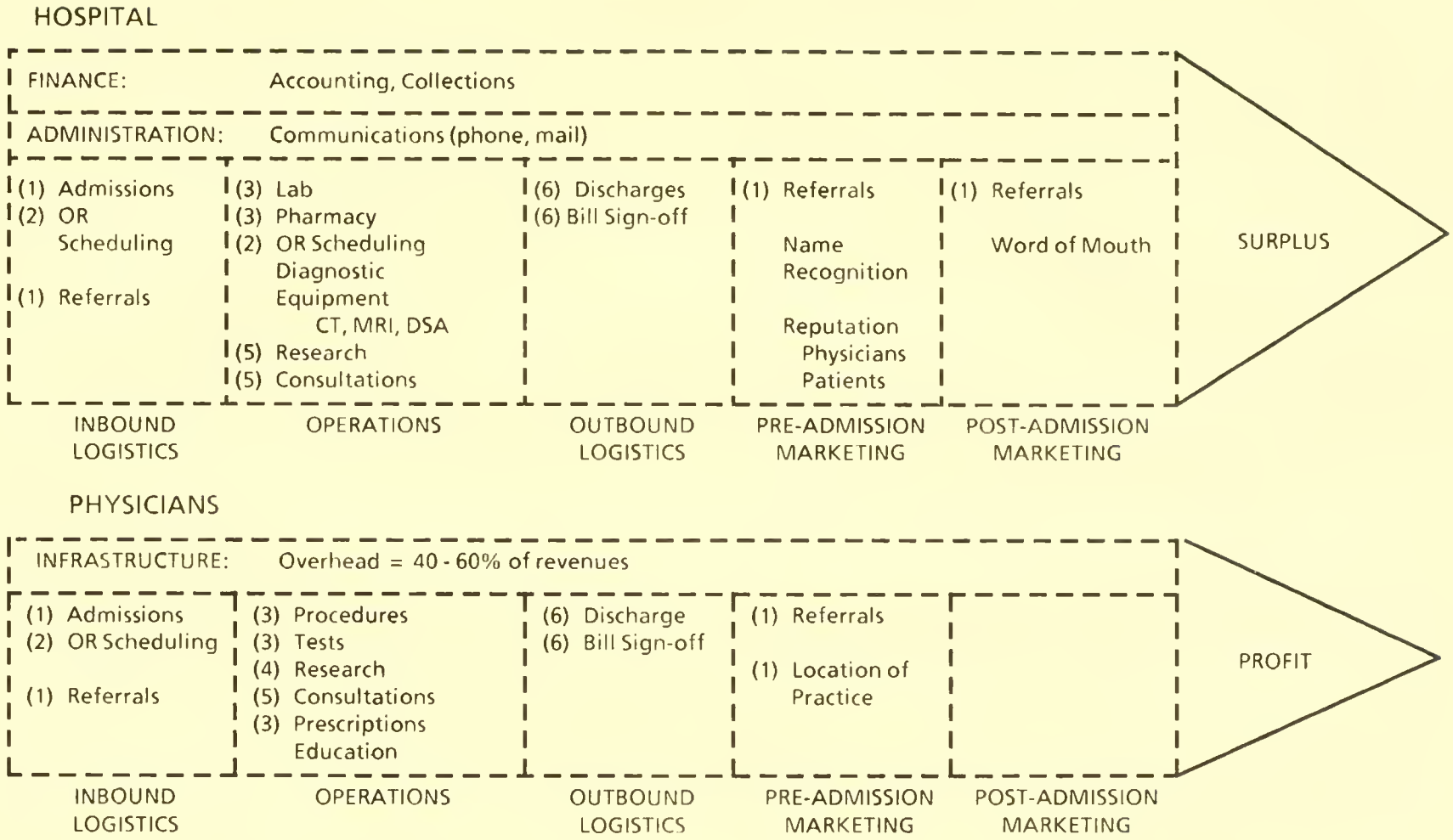

Figure 4. Selected Value Chain Items

PIN Linkages (Applications)	Bi-directional Benefits		Cooperative Payoffs		Support for Asymmetrical Controls		Factors Supporting Incrementalism
	Physicians	Hospital	Physicians	Hospital	Physicians	Hospital	
Referrals and Consultations	Stronger practice; greater revenue.	Higher volume for hospital; greater revenue	Better understanding of hospital's operations & problems Savings in time and overhead.	Tighter linkage to physicians. Savings in time and overhead.	Have no time to learn technicalities of computing. Want transparent network.	Wants to build physician dependence. Can build and service transparent network.	Must not alienate or pressure physicians into using network. Peer pressure and evolution strongest approaches.
Scheduling (OR, Admissions)	More satisfied office staff.	More productive hospital staff.	Savings in time and overhead. Want satisfied office staff & no way to solve problem.	Savings in time and overhead. Want access to physician staff & no way to solve problem.	Don't have expertise to run network. Don't have concensus to run network.	Can build and service transpatent network.	Office staffs themselves don't know what features they want, but will know as they use system.
Pharmacy	Savings in diagnostic time and costs.	More productive pharmacy.	Won't admit to needing medication advice, but might want some.	Increasing need to reduce pharmacy inventory & costs.	Don't have consensus on medications.	Can ask advisory doctor to add comments even without consensus.	Must distribute formulation and advisory knowledge without leaving impression that physicians have any diagnostic shortcomings.
Laboratory	Better response time for patients.	Better response time for physcians. More productive lab.	Have no control over lab operations.	Have no knowledge of physicians specific needs.	Have neither time not scale to set up own lab system.	Can operate lab but need response flexibility.	Cannot change lab prodedures faster than lab staff can adjust.

Figure 5 Value Chain Payoff Matrix

The last column of the matrix, labelled "Factors Supporting Incrementalism" suggests organizational reasons for adopting a highly modularized, incremental, evolutionary approach to implementing each application. It provides evidence for the importance of a careful match between what the organization needs and what the CIS technically provides. In addition to emphasizing benefits and incentives, the system must grow with sensitivity towards those factors which might unduly threaten local interests. For example, it is probably preferable for the referrals network to grow slowly - by example rather than by fiat. Forcing the physicians to use the network (attempting to apply an external incentive) might convince physicians that the hospital is trying to take advantage of them, leading to the establishment of informal referral networks that leave the hospital out of the loop.

6.4 Evolution

The evolution of any CIS solution requires special attention. The technical and organizational solutions to the CIS problem must match. The habits and incentives supported by technical sides of the system must align with those encouraged by the organizational effects of the system. To the degree that the two are misaligned (not an unlikely occurrence, considering how difficult it is to anticipate all the implications of boundary-crossing systems), the CIS needs the flexibility to evolve to fit the disparity. There are concepts from the strategy literature applicable to these ideas of alignment [Culbert and McDonough, 1980] and incremental evolution [Quinn, 1980]. Both could be applied to strategic systems planning in the same way that value chain categories are useful here.

PIN shows this match developing. Hospital management emphasizes that the system was first developed with an organizational need in mind, not a technical solution. The system hardware costs less than $100,000 - an inconsequential figure for a hospital that runs two IBM mainframes with a Data Processing support staff of 80 people. Unix mail is at best an interim solution; the network has little security, no data validation, and few of the safeguards of larger systems. The system, however, does match the hospital's organizational needs at the moment: it provides physicians and staff an

adequately convenient interface to disparate hospital departments. New applications can be added in hours and days, not weeks. Starting small and growing as physicians' needs grow, the system can evolve over time as the organization changes. As the price of processing power falls, the hospital can afford to subordinate efficient processing for organizational effectiveness.

7. SUMMARY AND CONCLUSIONS

7.1 Steps In Process

For the first step, we have used Porter's framework to describe the hospital's competitive position with a Buyers-Suppliers-Rivalry industry model. The exercise highlights the compression of hospital margins between flattening third-party payment schemes and rising operating costs. It notes the potential local referral problems caused by the hospital's location The next step superimposes a Critical Success Factors strategic response onto the five forces diagram. It emphasizes the importance of volume to the hospital as a way of fighting the revenue-cost squeeze, and suggests the importance of physician referrals to that strategy. It also adds the chronological aspect of the the hospital's situation - the institution needs to get its physicians used to providing data now so that conversion to bulk data provision in the future (to satisfy third-party payors) will be possible.

Value Chain analysis suggests methods for identifying key organizational problems and potential solutions. Figure 4 diagrams the key value chains involved in the hospital-physician relationship, and shows how selected PIN applications make connections within and between them. Systems features develop to parallel and facilitate these connections.

The Value Chain Payoff Matrix (Figure 5) concentrates on organizational solutions by showing a method for identifying and prioritizing benefits or payoffs arising from value chain linkages. It can suggest areas in which system development should start - areas of highest potential. It also can suggest areas in which the hospital might benefit from asymmetrical controls. It details potential

threats represented by each application to various interested parties - threats which might argue for an evolutionary, incremental system design.

7.2 Conclusions

This paper 1) suggests further definitions for the elements of Madnick and Wang's [1988] CIS process model; 2) introduces the concepts of bidirectional benefits, cooperative payoffs, and asymmetrical control as important elements for CIS design in boundary-crossing situations; and 3) suggests, by implication, an analytical process useful for planning the strategic aspects of CIS designs.

The hospital case is an evocative illustration for several reasons. First, it deals with a complex market: patients arrive at the hospital largely under the auspices of physicians' practices, and the characteristics leading to hospital preference are only partly known. Second, it focuses on a simple network that has complex organizational overtones: PIN is small but reaches across many boundaries, both inter- and intra-organizational.

Composite information systems cross organizational boundaries by definition. Each boundary crossing implies elements of bidirectional benefits, cooperative payoffs, and asymmetrical controls. Bidirectional benefits affect organizational units individually, cooperative payoffs benefit the organization at an aggregate level, and asymmetric controls allow for the development of strategic dependencies. A CIS must emphasize the positive aspects of these relationships in order to be effective and stable. The PIN network provides an example of an organization doing so for strategic reasons.

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